North Dakota Teachers' Fund for Retirement

Actuarial Experience Study as of June 30, 2009

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Purpose of Experience Study

- An Experience Study is a review of the assumptions and methods used by the actuary
  - TFFR has one done every five years
  - Last one done as of June 30, 2004
  - Five-year interval considered reasonable
    - GFOA recommend at least one every ten years
- This report tries to answer these questions for each assumption
  - What was the plan's actual experience?
  - How does that compare with current assumptions?
  - Is a change warranted?

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Purpose of Experience Study

- Assumptions are not static; they should change to reflect
  - New information
  - Improvements in data maintained
  - Mortality improvement over time
  - Changing patterns of retirements, terminations, salary increases, etc.
  - Changes in benefits that might impact assumptions
  - New or better actuarial tools/programs

Purpose of Experience Study

- Recent experience provides strong guidance for some assumptions (for example, mortality) and weak guidance for others (for example, the investment return rate)
- Some changes in pattern are permanent, while others are cyclical
- Based on results of study:
  - Actuary recommends revised assumptions
    - Best estimate standard for each assumption
  - Board accepts or rejects recommendations

Purpose of Experience Study

- The assumption set selected should be reasonable overall
  - No single "correct" answer
  - Small differences in assumptions can make large differences in results
- Keeping assumptions up-to-date will minimize gains and losses and keep the actuarially determined contribution rate stable

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A Look at Historical Liability Gains and Losses

- There is an expectation that, when assumptions are set effectively, that the gains/losses on an assumption will average to zero
- We look at the liability gains and losses each year to see whether there is a "bias" in the assumptions

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Recent Liability Gains and Losses (in $ Millions)

Year	Liability Gain/(Loss)	Actuarial Accrued Liability (AAL)	Loss as Percent of AAL
FY 2005	$ (5.8)	$ 1,965.2	-0.3%
FY 2006	(1.7)	2,073.9	-0.1%
FY 2007	7.8	2,209.3	0.4%
FY 2008	(15.7)	2,330.6	-0.7%
FY 2009	1.8	2,445.9	0.1%
Total/Avg.	$(13.6)	$ 11,024.9	-0.1%

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Recent Liability Gains & Losses

- The average liability loss over the last six years amounts to only 0.1% of the total actuarial accrued liabilities
- This means that, in the aggregate, the current assumptions are close to on target

Procedure

- Compared economic assumptions to:
  - General US price inflation and wage inflation statistics
  - TFFR specific salary increases
  - Expected return using five alternative capital market assumption sets, including Callan's
  - Economic assumptions should be consistent

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Procedure

- Analyzed demographic assumptions
  - Retirement, mortality, disability, other terminations
  - Compared to TFFR's actual experience
  - Used Actual-to-Expected (A/E) Ratio as analysis tool
  - Looked at patterns by age and service
- If A/E = 100% at all ages, assumption is "perfect"
  - Although we also need to look at fit for subgroups
  - Although we may want to build in some margin

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Assumptions Studied

- Economic assumptions
  - Price inflation (CPI)
  - Investment return
  - Salary increases (for individuals)
  - Payroll growth rate (for plan as a whole)
- Demographic assumptions
  - Mortality
  - Disability
  - Retirement
  - Other terminations

Data Used

- We generally used data from the last five years
  - FY 2005 – FY 2009
    - Used last ten years for salaries due to variability
  - If period is too short, there may not be sufficient data for analysis, especially for more minor assumptions
  - If period is too long, trends, such as improvements in mortality or changes in retirement patterns, may not be apparent
  - Some assumptions are influenced by general economic conditions (salary increases, withdrawal rates) and if period is too short, results may not be representative of full "business cycle"

Inflation

- The assumed inflation rate (currently 3.00% per year) is not used directly in the actuarial valuation, but it impacts the development of:
  - Investment return assumption
  - Salary increase assumptions
  - Payroll growth rate
- Actual inflation measured by the CPI-U during
  - Last 5 years: 2.60%
  - Last 10 years: 2.64%
  - Last 25 years: 2.97%
  - Since 1913: 3.27%

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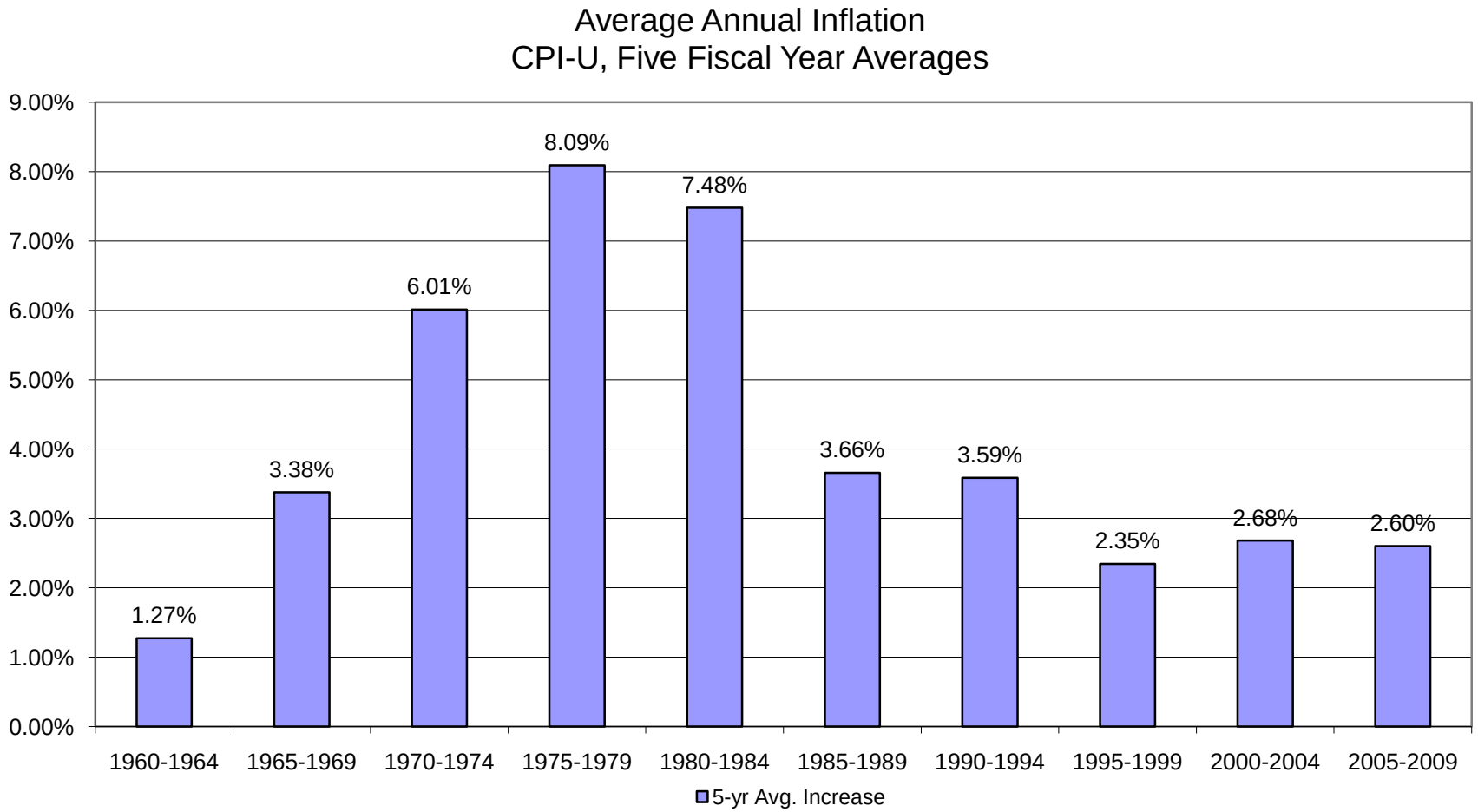
Inflation



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Inflation

- Callan assumes 2.75%
- Other investment firms have assumptions ranging from 2.30% - 3.00%
- Timeframe for investment consultants is shorter than ours, usually 5-10 years
- Actuaries for over 50% of large public pension funds have an assumption between 3.00% and 3.50%
  - Only four plans use an assumption less than 3.00%

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Inflation

- Bond market "predicted" 2.18% as of June 30, 2009
  - Return spread: TIPs vs. US Treasury bonds
    - 20 year bonds
  - But spread doesn't tell whole story
    - Ignores inflation risk premium in US Treasuries
    - Ignores liquidity differences
  - Cleveland Fed had historically published an adjusted spread
    - Suspended publication in Oct. 2008
    - Distortions caused by rush to US Treasuries

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Inflation

- Philadelphia Fed survey
  - Survey of professional forecasters
  - 2Q 2009 survey: expect 2.50% inflation for next ten years.
    - Lower for next three years, then averaging around 2.9-3.0% for last seven years
- We recommend no change in the current 3.00% assumption

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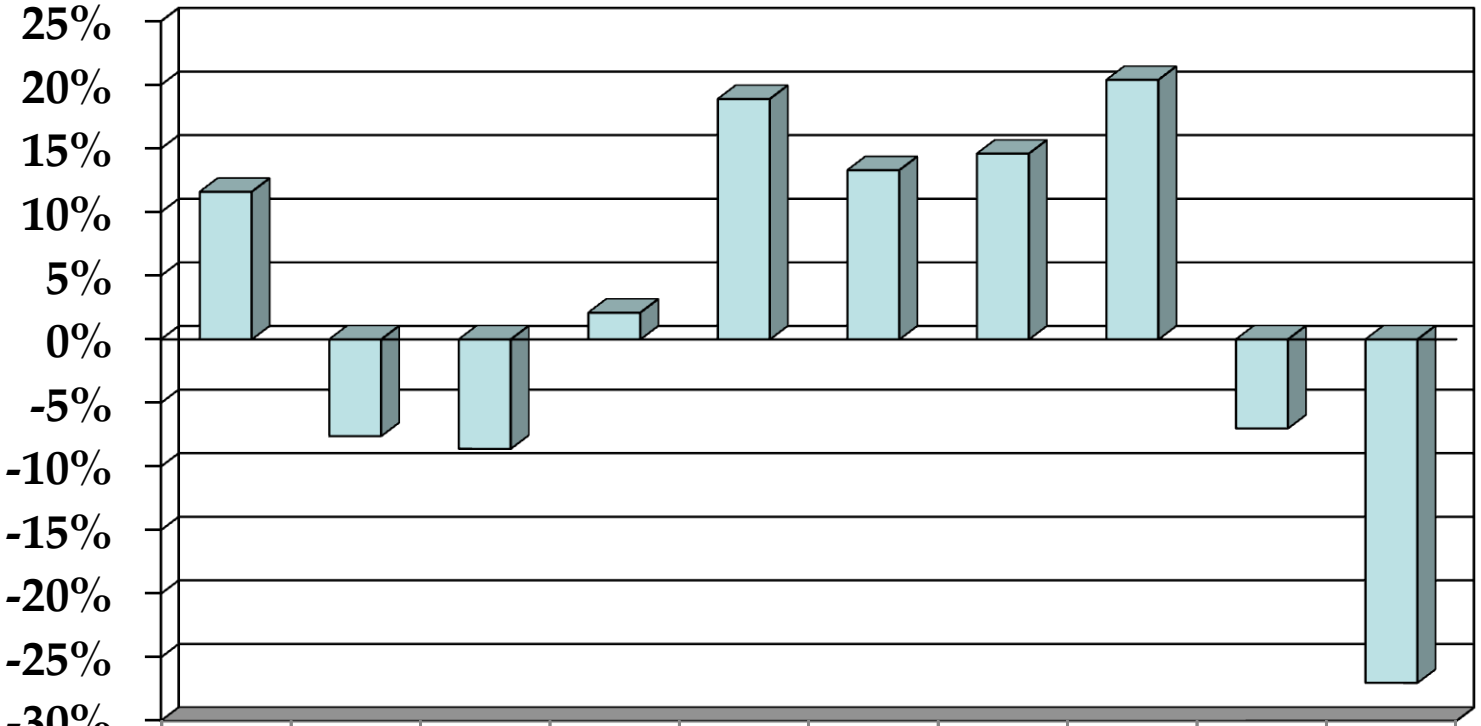
Investment Return Assumption

- Used to discount future expected cash flows (benefits and refunds), to determine the actuarial present values (liabilities)
- This is a critical assumption. Small changes, say 25 basis points, can change the required contribution rate (GASB ARC) by 1-2 percentage points (100-200 basis points)

Investment Return Assumption

- The current assumption is 8.00%
  - Represents the return, net of all administrative and investment expenses
  - For TFFR, these expenses amounted to about 65 basis points for last five years
    - Compared to about 45 basis points in last study
  - Assumption equals 3.00% inflation plus 5.00% net real return

History of Market Returns (Net)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Returns:	11.6%	-7.6%	-8.6%	2.1%	18.9%	13.3%	14.6%	20.4%	-7.0%	-27.0%

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Investment Return

- Average net market returns:
  - Last 5 years: 1.20%
  - Last 10 years: 1.96%
  - Last 15 years: 5.97%
  - Last 20 years: 6.57%
- Actual past experience over a period this short is not a good indicator of future returns
- 8.00% is, as shown on the next slide, the most common assumption made by large public plans

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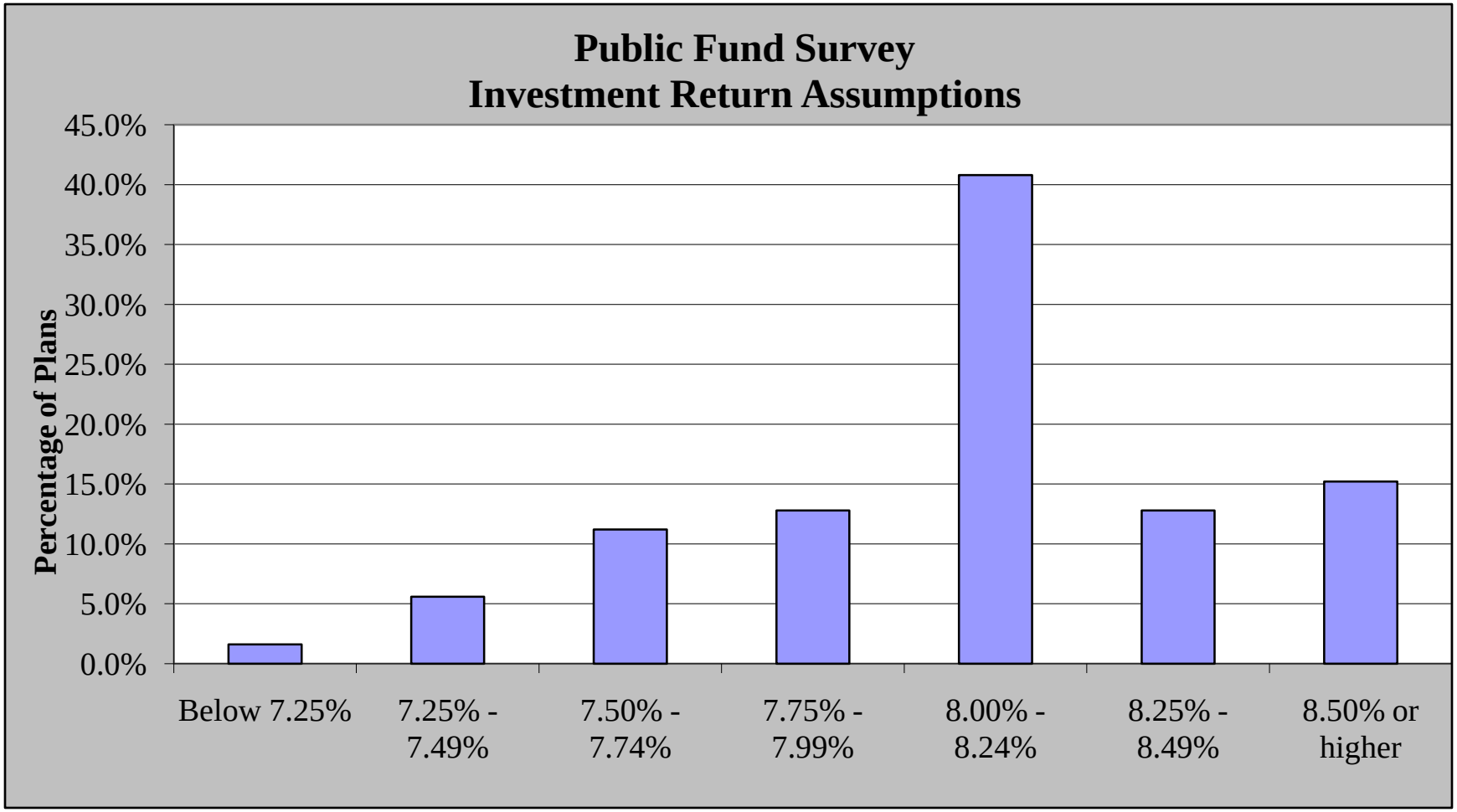
Comparison to Other Systems



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Investment Return

- Modeled TFFR's target asset allocation against five investment consulting firms' 2009 capital market assumptions
  - Including Callan's
  - Average net real return for five firms is 5.48%, above our 5.00% assumption
- We recommend no change to the 5.00% net real return assumption or the nominal 8.00% net investment return assumption
  - Some conservatism

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Salary Increase Assumption

- This assumption is meant to reflect all increase factors:
  - Across-the-board increases for all teachers
  - Increases to legally mandated minimum salaries
  - Step or service-related increases
  - Increases for acquisition of advanced degrees or specialized training
  - Promotions
  - Merit increases and bonuses, if applicable
  - Extra duties, if included in plan's compensation definition

Salary Increase Assumption

- Used for projecting individual member's pay and benefits
  - Unisex
  - Service-related
- Not based on increases in average salary
  - Distortion due to longer-service (higher-paid) members retiring and being replaced by new teachers
  - We look at increases for continuing actives
    - Members active in two consecutive years

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Salary Increase Assumption

- Current assumption consists of three components
  - Price inflation (3.00%)
  - Additional across-the-board increases (1.50%)
  - Service-related increases for first 15 years
    - Meant to reflect the higher increases received by shorter-service members
- Total assumed increases range from 14.00%—the first increase for a new teacher—to 4.50% for teachers with 15 or more years of service

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Salary Increase Assumption

- Increases for continuing members for last ten years averaged 5.74%
- Current assumptions produce average increase over last ten years of 5.76%
- Year-by-year increases shown on following chart
  - Average increases for all continuing actives

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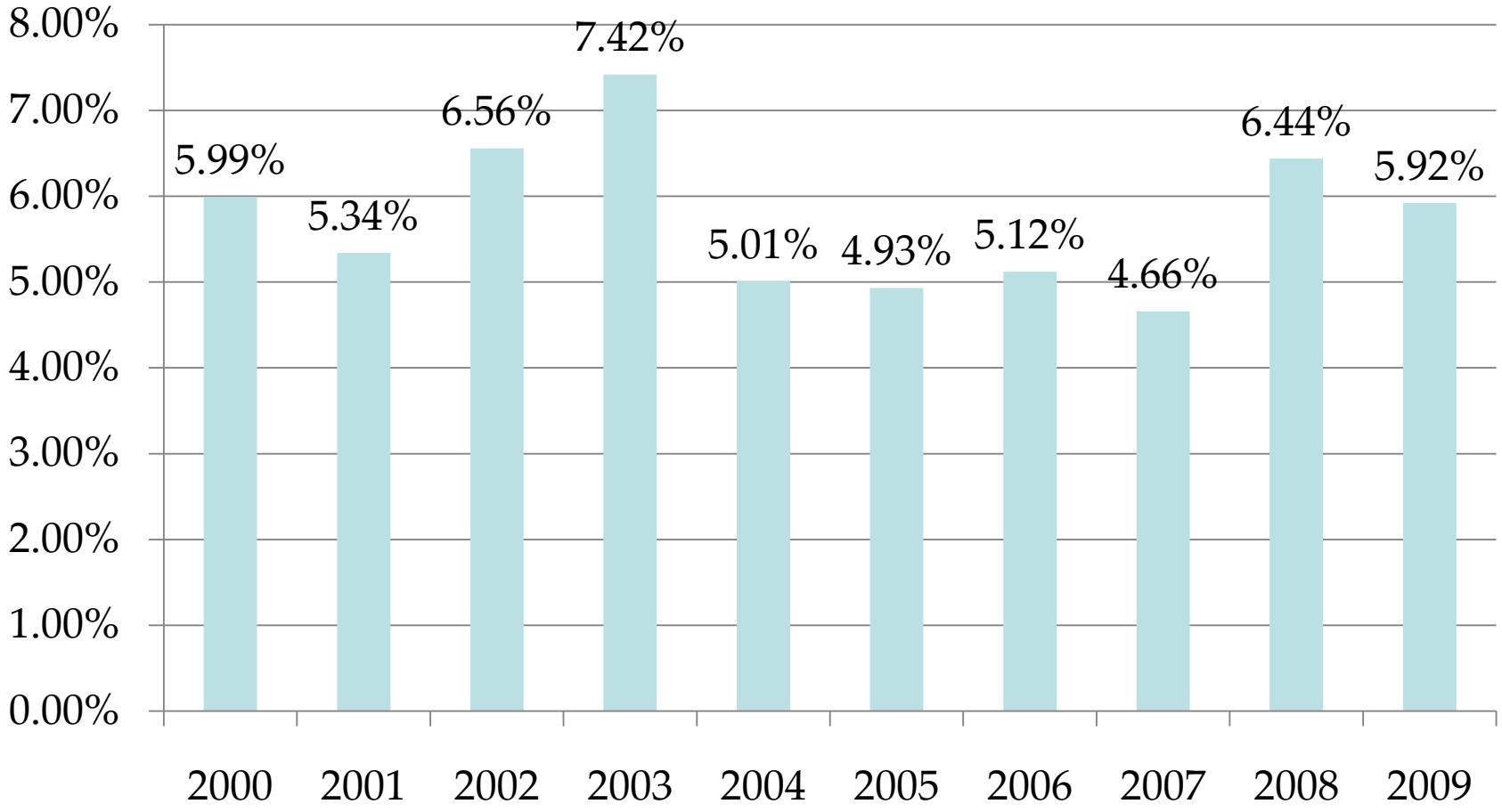
Salary Increases for Continuing Actives



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Salary Increase Assumptions

- Despite close agreement between actual and expected increases, we recommend adopting new increase rates
  - Inflation during last 10 years (2.64%) was lower than our 3.00% assumption
    - Expected average increase over inflation: 2.76%
    - Actual average increase over inflation: 3.10%
  - Fit was poor for employees with 10-24 years of service

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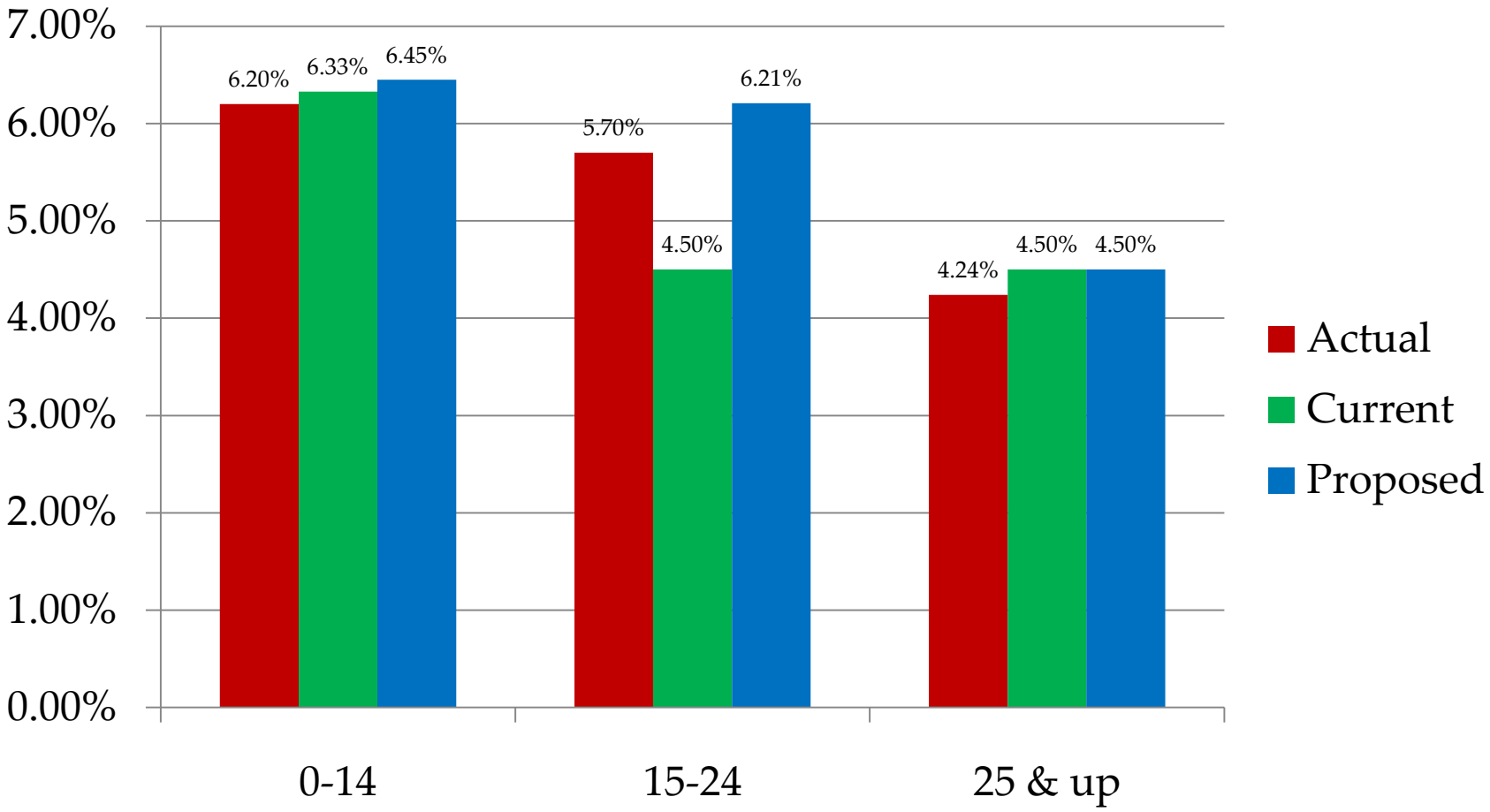
Salary Increase Assumptions

- Service range extended from 15 to 25 years of service
- New rates range from 14.75% (first year) to 4.50% (members with 25 or more years of service)
- Most increases for members with 10-24 years of service

Salary Increases by Service Group



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Membership Growth Assumption

- Increase in number of active members
- Used in projections, not in valuation
- Current assumption is -0.50% per year
- Based on census bureau projections of school age children 2000 – 2030
  - Most of projected decreases have already occurred
    - 21% from 1994 to 2009 per DPI
    - Little effect on active membership: 1% decrease

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Membership Growth Assumption

- Census bureau projections of school age children 2010 – 2030 show 6% decrease
  - -0.31%/year
- But DPI expects little change in active membership over the next ten years
- We recommend assuming no increase or decrease in active membership
  - 0.00% increase/decrease

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Salary Increases for New Entrants

- Assumption used for projections only
- Average salary for each year's cohort of new entrants is expected to be paid 4.00% more than prior year's cohort
  - 1% above inflation
- Consistent with experience over last 5 and 15 years, given differences in inflation
- Recommend no change

Payroll Growth Assumption

- Used in amortizing unfunded liability, not in projecting benefits. Employer amortization payments in dollars assumed to increase at payroll growth rate
  - The higher the payroll growth assumption, the lower the contribution rate needed to amortize the UAAL
- Current assumption is 2.00%

Payroll Growth Assumption

- Average actual increase in payroll:
  - Last 5 years: 3.16%
  - Last 10 years: 3.41%
- Historical analysis can be influenced by
  - Increases or decreases in number of members
  - Differences between actual and assumed inflation
- In theory, payroll should grow at assumed increase for new entrant cohorts (4.00%)

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Payroll Growth Assumption

- However, retirements of baby boomers (with lower-paid replacements) will be a drag on payroll growth over next 15 or so years
- We prefer to look at long-term projection results
  - With no membership growth
  - With assumed salary increases
  - With 4% increases in new entrant salaries

Payroll Growth Assumption

- Projections of payroll growth
  - 06/30/2009: $ 466.9 million
  - 06/30/2019: $ 628.5 million
  - 06/30/2029: $ 902.0 million
  - 06/30/2039: $1,332.8 million
- Average increases
  - Next 10 years: 3.02%
  - Next 20 years: 3.35%
  - Next 30 years: 3.56%

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Payroll Growth Assumption

- Recommend assuming 3.25% average payroll growth rate
  - In line with average over next 20 years
  - A bit aggressive when looking at next 10 years
  - But a bit conservative compared to next 30 years

Demographic Assumptions

- In looking at demographic assumptions—the assumptions about why members leave TFFR—we compare what we expected with what actually happened.
- A convenient way to look at this is to use the ratio of Actual/Expected.
- This means that when the A/E is greater than 100%, more of the incidence occurred than what was expected (and vice versa)

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Demographic Assumptions

- But the A/E measure is not an absolute indicator of the reasonableness of the assumptions.
- For example, a plan could have an overall A/E ratio of 100% for an assumption, yet more high liability members were above 100% while the low liability members were below 100%.
- So we also look at average ages; segments of the population and other measures for further assurance regarding the assumptions

Demographic Assumptions

- Depending on the assumption, an A/E can be either conservative or aggressive.
- For example, assume the turnover experience had an A/E of 110%.
  - That would mean there were more terminations than expected
  - That usually also means the assumption is conservative, and the experience is generating a gain

Post Retirement Mortality

- Includes only age/service retirees, excludes beneficiaries, survivors, joint annuitants and disabled retirees
- Current assumptions for nondisabled retirees and beneficiaries: 1994 Uninsured Pensioner Mortality Table, males set back three years and females set back two years
- A/E current study:
  - Males=98%, Females=100%
  - 239 male deaths and 558 female deaths

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Post Retirement Mortality

- A/E last study:
  - Males=111%
  - Females=111%
- Desirable to have margin for future mortality improvement
- Large changes since last study
  - More retiree lives, fewer deaths
- Current tables have poor fit at ages 65-79
  - Males: 81%
  - Females: 69%

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Post Retirement Mortality

- We've seen this poor fit before for teacher groups
- Therefore, we recommend adopting new tables, based on another (larger) state's teacher population
  - Then multiplying these rates by 80% (males) and 75% (females) to match TFFR mortality levels

Post Retirement Mortality

- A/E ratios (overall)
  - Males: 118%
  - Females: 115%
- A/E ratios (ages 65-79)
  - Males: 122%
  - Females: 126%
- Intentionally higher margin for future improvement

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Disabled Mortality Rates

- Very minor assumption, but needs updating
- A/E ratios:
  - Males: 70% (5 deaths)
  - Females: 77% (8 deaths)
  - Low credibility
- A/E ratios were also low in last study
- Current assumption based on old Social Security Study

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Disabled Mortality Rates

- We recommend updating assumption to RP-2000 disabled-life tables for males and females
  - Males x 80%
  - Females x 95%
- Recommended tables produce AE ratios:
  - Males: 116%
  - Females: 121%
  - Margin for future improvement

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Active Mortality Rates

- Very minor assumption
- Current assumption: 65% of post-retirement rates
- Only 30 deaths vs. 52 expected
  - Male AE ratio: 70%
  - Female AE ratio: 49%
  - Low credibility
- Recommend modifying assumption to 60% (males) and 40% (females) of new post-retirement mortality assumption

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Active Mortality Rates

- New assumptions produce AE ratios of:
  - Males: 88%
  - Females: 79%
- We didn't want to reduce current assumption further, due to low credibility
- Assumption in line with ten-years experience (7-8 deaths/year).

Rates of Disability

- Current assumption: 160% of GRS Table 513 for both males and females
- 40 new disabilities vs. 64 expected
- A/E ratios: 58% (males) and 64% (females)
- Ratio was low in last study too
  - 74% overall
- We recommend changing to 110% of Table 513, producing AE ratios of:
  - Males: 84%
  - Females: 93%

Rates of Termination

- Termination rates cover all causes of termination other than death, disability or retirement
  - Voluntary or involuntary
  - Refund or deferred benefit
- Current rates reflect age and service
  - With all service over 10 years grouped together

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Rates of Termination

- The current A/E ratios are:
  - Males: 104%
  - Females: 112%
  - AE ratios over 100% are conservative
  - A/E's similar to the prior experience study
  - Overall, a very good result
- However, we are recommending new assumptions

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Rates of Termination

- Move to service-only tables
  - Current tables overly complex
- Recognize differences for members with 10+ years of service
- AE ratios on recommended tables are:
  - Males: 102%
  - Females: 103%
  - Better fit to data

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Rates of Retirement

- Current assumptions include:
  - Separate rates for males and females
  - Separate rates by age
    - Different rates for reduced and unreduced retirement
    - Different rate at age first eligible for unreduced, if less than 65 (50% for males, 65% for females)
- Rates applied only to those eligible

Rates of Retirement

- Current rates for unreduced retirement are too high
  - Expected: 2,303
  - Actuals: 1,440
- A/E ratios for unreduced retirement:
  - Males: 79%
  - Females: 56%
- Worse for those at first eligibility < 65
  - Males: 57%
  - Females: 40%

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Rates of Retirement

- Therefore, we recommend adoption of new rates, as shown in report
- For those first becoming eligible, add 10% to age-related rate, rather than using flat rate
- On this basis, AE ratios become:
  - Males: 92%
  - Females: 93%
  - Conservative
- At first eligibility, AE ratios are 86% (males) and 90% (females)

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Rates of Retirement

- For reduced retirement, AE ratios were:
  - Males: 74%
  - Females: 125%
- Recommend modifying rates, producing new AE ratios of:
  - Males: 113%
  - Females: 116%
  - Conservative

Other Assumptions

- We recommend no changes to other minor assumptions, such as:
  - Percent married
    - 75%
  - Age difference between members and spouses/beneficiaries
    - Males are 3 years older
  - Refunds for vested members
    - Terminating members take refund if more valuable, otherwise choose deferred benefit
  - Retirement age for deferred vested members
    - When first eligible for unreduced retirement

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Actuarial Methods

- We recommend no changes to the actuarial methods
  - Entry age normal cost method
    - Using aggregate approach based on hypothetical new entrants
  - Asset smoothing method
    - 5 year smoothing
  - Amortization period
    - 30 years
    - GASB No. 25 maximum

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New Entrant Profile

- Used to determine normal cost
- Current profile based on new hires, FY 2000- FY 2004
- Recommend updating profile based on more recent date, FY 2005 – FY 2009
  - Little change
  - Average age at entry decreased from 31.6 to 30.4
  - Percent female increased from 73% to 75%

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Actuarial Impact

Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Increase/ Decrease
Normal cost	10.26%	10.57%	0.31%
Unfunded actuarial accrued liability (UAAL)	$545.6 million	$610.6 million	$65.0 million
Funded ratio	77.7%	75.7%	-2.0%
Funding period	Infinite	Infinite	NA
GASB 25 Annual Required Contribution	10.78%	10.92%	0.14%
Margin (compared vs. 8.25%)	-2.53%	-2.67%	-0.14%

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Actuarial Impact

Item	UAAL ($ Millions)	ARC (%)
Current valuation (July 1, 2009)	$545.6	10.78%
Mortality rates	83.5	1.66%
Disability rates	0.8	-0.01%
Retirement rates	(44.3)	-0.94%
Termination rates	3.8	0.05%
Salary increase rates	16.5	0.56%
New entrant profile	4.7	-0.04%
Payroll growth rate	0.0	-1.14%
All recommended assumptions	$65.0	10.92%

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Conclusion

- We recommend that the Board adopt the changes described in Section IV of the report
- We believe this will provide a more accurate picture of TFFR's actuarial condition

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